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# Using Research on Neuroeconomics Games in School Leaders' Decision-Making Training

This manuscript has been peer-reviewed, accepted, and endorsed by the International Council of Professors of Educational Leadership (ICPEL) as a significant contribution to the scholarship and practice of school administration and K-12 education.



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*This article demonstrates how to use three neuroeconomics games adapted from game theory—the Ultimatum Game, the Trust Game, and the Public Goods Game—in school leaders' decision-making training. These three games have been commonly used in the emerging field of neuroeconomics—an interdisciplinary field intersecting behavioral economics, psychology, and cognitive neuroscience. For each game, I first outline how to play it in the training of school leaders' decision making, followed by the constructs relevant to leaders' decision making, including fairness, justice, inequity aversion, reciprocity, emotions, social identity, trust, distrust, and altruistic punishment. These games, with a lighthearted touch, serve as part of the pedagogical support to help school leaders uncover salient constructs relevant to their decision-making process.*

**Keywords:** altruistic punishment, decision making, distrust, emotions, inequity aversion, neuroeconomics, educational leadership, fairness, equity, justice, social identity, trust

This article demonstrates how to use three neuroeconomics games adapted from game theory—the Ultimatum Game, the Trust Game, and the Public Goods Game—in training school leaders’ decision making. Neuroeconomics is an emerging, interdisciplinary field intersecting three fields: (1) behavioral economics—the field studying human decision making and the ensuing behaviors, (2) psychology—the field studying human mind and behaviors, and (3) cognitive neuroscience—the field studying brain mechanisms of mental processes. To date, the decision-making training in school leadership preparation programs has mostly centered around data-driven, evidence-based decision making (Cannata et al., 2017) and shared, participative decision making (Ni, Yan, & Pounder, 2018). The scant presence of theoretical constructs and theories on decision making in educational leadership field is in stark contrast with the robust research on decision making in behavioral economics, psychology, and cognitive neuroscience (Wang, 2019a). A few examples could suffice. As one of the pioneering researchers in behavioral economics, Daniel Kahneman’s work on the psychology of decision making challenged the assumption of rationality in human decision making, and was awarded the 2002 Nobel Prize in Economic Sciences (Kahneman & Tversky, 1979; Kahneman, 2011). Following this fledgling and fast-growing line of research, Richard Thaler’s work on irrational, abnormal decision making that did not fit classic economic theories was awarded the 2017 Nobel Prize in Economic Sciences (Thaler, 2016). Other recent work on decision making includes Dan Ariely’s detailed account of *predictably irrational* decision making and human behavior (Ariely, 2008), Antonio Damasio’s (1994) compelling argument from the neurobiological view on the inseparable role of emotions in reasoning and decision making, as well as Jonathan Haidt’s (2012) elephant-rider analogy that most moral decisions are made by the elephant (i.e., our unconscious intuitions that encompass emotions and biases), and the rider (i.e., reasoning) can sometimes rein in the elephant but oftentimes provide post hoc rationalization of the decisions. This rich body of research has provided telling evidence on psychological and brain mechanisms of human decision making. Yet these compelling findings have not been fully capitalized on in decision-making training in school leadership preparation programs (Duke, 2018).

Building on the current focus on data-driven, participative decision making in school leadership preparation programs, to advance the training of leaders’ decision making, this article draws attention to the recent neuroeconomics research findings to enrich school leaders’ understanding of human decision-making process. In the field of educational leadership, Lakomski and Evers (2010) drew upon cognitive neuroscience findings to assert the limitations of rationality in decision making, argued for the essential role of emotions in decision making, coined the phrase *passionate rationality*, and called for including emotions in school leadership preparation programs. Regarding school leaders’ decision making, the Professional Standards of Educational Leaders (formally known as the Interstate School Leaders Licensure Consortium Standards) have two references: one is under Standard 2 Ethics and Professional Norms (a) “act ethically and professionally in personal conduct, relationships with others, decision-making, stewardship of the school’s resources, and all aspects of school leadership” (p. 10); the other is under Standard 3 Equity and Cultural Responsiveness (g) “act with cultural competence and responsiveness in their interactions, decision making, and practice” (p. 11; National Policy Board of Educational Administration, 2015). To that end, to offer practical guidance on school leaders’ decision-making training, this article demonstrates how three commonly used neuroeconomics games (Glimcher & Fehr, 2014)—the Ultimatum Game, the Trust Game, and the Public Goods Game—can be used to teach decision making in school leadership preparation programs. The three games introduced in this article, as part of the pedagogical support for ethical and culturally responsive school

leadership training (Mullen, 2017), are powerful tools to uncover salient aspects of decision-making processes. These games, with a lighthearted touch, are actually experiments used in research on social decision making—the decisions made in a social context in which decision outcomes involve other people. These games are particularly important to reveal implicit biases and unconscious automaticity of emotions in decision making. Using the games as a proxy for teaching decision making, students in school leadership preparation programs participate in the decision-making games themselves, reflect on their own decision making process and behaviors, followed by group discussions on the constructs related to decision making (e.g., fairness, justice, inequity aversion, reciprocity, emotions, social identity, trust, distrust, and altruistic punishment) and how to translate the constructs to leadership practices. This game-approach decision-making training aims to achieve four learning goals: (1) identifying the blind spots of data-driven decision making, (2) describing the constructs of decision making, (3) reflecting on students' own decision-making processes, and (4) creating a plan to optimize decision making in professional settings. In the following pages, I first provide an overview of the blind spots of data-driven decision making, one of the dominant decision-making approaches taught in school leadership preparation programs. Next, I outline how the three neuroeconomics games can be used in school leadership preparation programs, followed by the constructs demonstrated by the games.

### **The Blind Spots of Data-Driven Decision Making in Social Decisions**

The current training on decision making in school leadership preparation programs primarily teaches school leaders to make decisions driven by data. The theory guiding such a decision-making approach is the rational choice theory, also called the theory of utility maximization, the centerpiece of classic economic theories of decision making at both individual and organizational level (March, 1991; Smith, 1776/1981). Tacitly assuming that decision makers are rational, this decision-making approach uses data as the means to an end: the data as the means of information on choice alternatives, consequences, and preference ranking of the alternative consequences; decisions are the end of maximized utility (i.e., desirable consequences and outcomes). Despite the value of data-driven decision making, there are many blind spots that warrant school leaders' attention, including, but not limited to, the politics of data use (Henig, 2012; Parkhurst, 2017) and the inadequate role of data in social decisions—the decisions made in a social context and the decision outcomes have an impact on others. Here I focus on the blind spots of data-driven approach to making social decisions.

If data are the means to an end of decision making, then what does the end look like? What are the desirable outcomes of school leaders' decisions? What if there is a tension between leaders' self-interest (e.g., to advance the leader's career) and the group interest of the teachers and students? If the leaders allow their self-interest to override the group interest, then the decision is considered rational from the leaders' viewpoint, because the leaders attempt to maximize the utility (i.e., their self-interest in this case), according to the rational choice theory. But is this the optimal decision for the group? Imagine a school leader advances his or her career by all means possible. People might think such a leader is calculating, ruthless, and cold-hearted. The literature in educational leadership does argue that a school leader's decision making is not a zero-sum game, and a leader should cooperate with teachers to achieve the win-win outcomes (Shen & Xia, 2012). But when cooperation means that a leader sacrifices self-interest, what motivates the leader to cooperate? How does a leader evaluate the risk of cooperation? In the case of the trade-off between

the leaders' self-interest and group interest, data-driven decision making does not seem to provide specific, practical guidance for school leaders as decision makers.

Also, imagine a school leader who has finite resources that can be allocated to meet the learning needs of a fixed number of students. Should the leader allocate the resources to low-performing students whose academic enhancement might not yield a substantial improvement in the school rating in school accountability system in the short term, or to those students whose academic achievement can ensure that the school rating has a solid grounding at the end of school year? In this case, the data-driven decision making, again, does not seem to have much explanatory power of school leaders' decision making and the resultant leadership behaviors.

With such limitations and ambiguity of data-driven decision making in a social context such as schools, this article introduces three neuroeconomics games that have been used to study the decision-making topics on fairness, justice, inequity aversion, reciprocity, emotions, social identity, trust, distrust, and altruistic punishment. These games enrich school leaders' understanding of what motivates people and what are the limits of human rationality. Although the games introduced in this article do not capture the full richness of human motivation and limits of rationality in decision making, they offer a pedagogical tool for school leadership training in decision making by drawing on the insights from neuroeconomics. Using the games to explore fascinatingly complex decision making in social settings, I first introduce how to play the games in the class of decision making, psychology, and ethics (applicable in both online and face-to-face instructions; see Figure 2, 4, and 6), followed by the constructs relevant to the decision-making training in school leadership preparation programs.

### **The Ultimatum Game**

The Ultimatum Game, first introduced in 1982 (Güth, Schmittberger, & Schwarze, 1982), has been widely used to study decision making, particularly the decisions involved in bounded rationality, fairness, justice, inequity aversion, emotions, and social identity. Over the last three decades, there have been countless variations of the Ultimatum Game devised to study decision making. Nevertheless, the classic version of the Ultimatum Game is that two people (see Player 1 and 2 in Figure 1) are matched randomly and anonymously to play the game. Player 1 is endowed with a sum of money by the experimenter (say \$10), and proposes how to divide \$10 with Player 2. Player 2 then decides whether to accept the proposal or not. If accepted, both players take the money as it is proposed. If rejected, both players receive nothing. The two scenarios of Player 2's decision making (accept vs. reject) in the Ultimatum Game are displayed in Figure 1. The converging findings of decades of the Ultimatum Game research show that most people as Player 1s propose dividing 40%-50% of the money, and Player 2s usually accept such a proposal. This is a win-win situation as both players receive earnings. However, when Player 1 proposes sharing only 20% of the money, Player 2 rejects it half of the time; the rejection rate increases as Player 1 proposes even less money (van Damme et al., 2014).

Why are people willing to receive nothing by rejecting the offered money? The rejection decision contradicts the classic view of economic rationality. If we make rational, data-driven decisions to maximize the outcomes (earnings in this case), we as Player 1s should propose offering the smallest amount of money, and as Player 2s accept to take whatever the amount of money offered because we have nothing to lose. Even when Player 1 keeps 90% of the money, we as Player 2 still receive 10% of the money which is better than nothing. But over the last three decades of the Ultimatum Game research, people have consistently rejected low offers. Why?

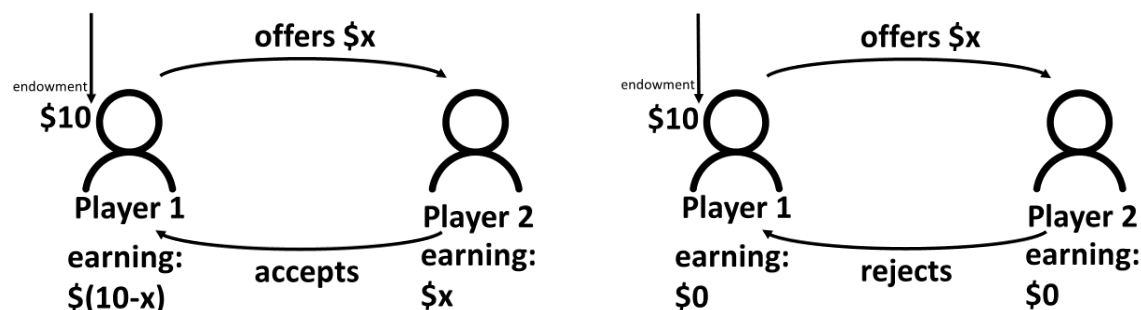


Figure 1. The Ultimatum Game

## Fairness & Justice

The seemingly irrational decision of rejection in the Ultimatum Game is driven by fairness. People desire to be treated fairly, and they do not hesitate to punish those who treat them unfairly (van Damme et al., 2014). The magnitude of the rejection decision in the Ultimatum Game varies substantially across people in different countries, but participants in 15 populations (e.g., Ghana, Kenya, Tanzania, Colombia, Ecuador, Russia, and U.S. rural and urban) all demonstrate their willingness to administer costly punishment when they are treated unfairly (Henrich et al., 2006). This innate desire for fairness is termed as “self-centered inequity aversion” (Fehr & Schmidt, 1999, p. 819). In fact, resistance to inequity is not only universal among humans, but also seen among monkeys as evidenced by the aptly titled article “Monkeys Reject Unequal Pay” in the journal *Nature* (Brosnan & de Waal, 2003). We are so averse to unfair, inequitable outcomes that we react negatively to the point that we are willing to give up some material payoff to punish our social partners who treat us unfairly (Decety & Yoder, 2017). In the Ultimatum Game, the unfair offer from Player 1s triggers negative emotions such as anger and disgust, motivating Player 2s to reject the unfairness, even at the cost of losing what is offered to them. What motivates this decision of rejecting unfairness is considered as justice motivation: “people’s tendency to prefer justice” (Decety & Yoder, 2017, p. 7). This justice motivation is thus thought to be a primary mechanism for establishing and maintaining a social norm of cooperation.

The links among unfairness, negative emotions, and justice-motivated rejection decision in the Ultimatum Game have been supported by brain-imaging evidence. When Player 2s were put in a brain scanner, their rejection decision was associated with increased brain activity in the amygdala—the brain region processing emotions, particularly negative ones (Gospic et al., 2011; Zald, 2003). On the one hand, the more amygdala activity in Player 2s’ brain, the more likely they reject the unfair offer. On the other hand, when people have brain damage in the amygdala, they are typically generous in the Ultimatum Game and do not reject unfair offers (De Martino, Camerer, & Adolphs, 2010; van Honk, Eisenegger, Terburg, Stein, & Morgan, 2013). In addition to the emotional amygdala activity as a response to unfairness, the extent of the unfairness in Player 1s’ offer is correlated with Player 2s’ increased brain activity in another brain region called anterior insula (AI)—the brain area processing unpleasant emotions of disgust and anger, as well as pain and distress (Calder, Lawrence, & Young, 2001). Specifically, the increased activity in Player 2s’ AI *precedes* their decision of rejecting an unfair offer (Sanfey, Rilling, Aronson, Nystrom, & Cohen, 2003). Further, the emotional AI competes against the dorsolateral prefrontal cortex (dlPFC)—the brain region that supports our cognitive capacity and self-control over

impulsive behavior. Intriguingly, the rejection decision in the Ultimatum Game is associated with more activity in the emotional AI than the cognitive dlPFC; more activity in the cognitive dlPFC than the emotional AI (Knoch, Pascual-Leone, Meyer, Treyer, & Fehr, 2006; Sanfey et al., 2003). Put differently, Player 2s' decisions of acceptance or rejection is the outcome of the interactions between cognition and emotions. The acceptance decision is made when the cognitive dlPFC overrides the emotional AI, enabling Player 2s to maximize their earning by taking the offered money and inhibiting their emotional desire to reject the unfairness. By contrast, the rejection decision is not driven by purely data or decision makers' cognitive capacity, but by the negative emotions such as anger and disgust.


To further examine the social aspect of decision making, Player 1 in the Ultimatum Game is sometimes a computer (non-social condition) and other times a human (social condition; Sanfey et al., 2003). When the unfair offer comes from a computer, Player 2s are more likely to accept the unfair offers. Player 2s, however, have a stronger emotional reaction to the unfair offer coming from a human, as evidenced by the stronger activation in emotion-related brain regions (e.g., the AI and anterior cingulate cortex). These differing brain activity patterns suggest that the emotional reaction to unfairness does not come from the amount of the offer itself, as both computer- and human-Player 1 offered the same amount of money. Rather, the emotional reaction is subject to who makes the offer and the unfair intention of our social partners.

Further, in social decision making, fairness is not a static construct. Fairness evolves with the unfolding history of social interactions through which people's reputation is developed. In the Ultimatum Game that is *repeatedly* played, when Player 1s can access the information on Player 2s' past accepted offers, the fairness and cooperation are more likely to emerge (Nowak, Page, & Sigmund, 2000). On the end of Player 2s, when they accept unfair offers, they form the reputation of being weak and their chance of being treated unfairly in the future will increase. However, when they reject unfair offers even at the cost of their own earnings in the Ultimatum Game, they develop a reputation of insisting on fairness. Therefore, "when reputation is included in the Ultimatum Game, adaptation favors fairness over reason" (Nowak et al., 2000, p. 1774). Suffice it to say, fairness evolves in social interactions, and is subject to social partners' past decisions in social interactions.

You are to propose to the other person on how to divide a \$10 endowment between you and the other person.  
 If the other person accepts your offer, both of you take the money as it is proposed.  
 If the other person rejects your offer, both of you receives no money.  
 As a proposer, please use the bar to mark how much money you want to offer to the other person?

0      1      2      3      4      5      6      7      8      9      10

1



As a responder, please indicate whether you accept or reject the other person's proposal on how to divide the \$10 endowment.

	Accept	Reject
If the other person keeps \$9 and gives you \$1, would you accept the offer?	<input type="radio"/>	<input type="radio"/>
If the other person keeps \$8 and gives you \$2, would you accept the offer?	<input type="radio"/>	<input type="radio"/>
If the other person keeps \$7 and gives you \$3, would you accept the offer?	<input type="radio"/>	<input type="radio"/>
If the other person keeps \$6 and gives you \$4, would you accept the offer?	<input type="radio"/>	<input type="radio"/>
If the other person keeps \$5 and gives you \$5, would you accept the offer?	<input type="radio"/>	<input type="radio"/>
If the other person keeps \$4 and gives you \$6, would you accept the offer?	<input type="radio"/>	<input type="radio"/>
If the other person keeps \$3 and gives you \$7, would you accept the offer?	<input type="radio"/>	<input type="radio"/>
If the other person keeps \$2 and gives you \$8, would you accept the offer?	<input type="radio"/>	<input type="radio"/>
If the other person keeps \$1 and gives you \$9, would you accept the offer?	<input type="radio"/>	<input type="radio"/>
If the other person keeps \$0 and gives you \$10, would you accept the offer?	<input type="radio"/>	<input type="radio"/>

*Figure 2.* A screenshot of using the Ultimatum Game in decision-making instruction in a school leadership preparation program. It was set up on the author's university Qualtrics platform. The students fill out the survey in class on their laptops or smartphones via a weblink provided by the instructor. The instructor then uses the students' real-time results to introduce the constructs related to decision making, including rational choice, fairness, justice, reciprocity, emotions, and social identity.

### Emotion Expression, Regulation, and Induction

Given the role of negative emotions in making rejection decisions in the Ultimatum Game, the opportunities of expressing negative emotions hold sway over people's decision making. We humans prefer to express emotions when they are aroused (Darwin & Ekman, 1998). The desire to express negative emotions can itself be an important motivation underlying the decision of rejecting unfairness to carry out costly punishment (Xiao & Houser, 2005). In Xiao and Houser's (2005) study, Player 2s have an opportunity to write a message to Player 1 simultaneously with



their decision to accept or reject Player 1's offer. When Player 2s express emotions, they are more likely to accept the unfair offer, because the costly punishment decision of rejection occurs in part as a means to expressing negative emotions (e.g., anger and disgust). To that end, providing channels for people to express their negative emotions is a cost-effective approach to maximizing the earnings of both Player 1 and 2 in the Ultimatum Game. The implication of this finding for school leadership training is to encourage leaders as decision makers to create opportunities for people to express their emotions in order to promote cooperation as the social norm. This is because the lack of opportunities to express negative emotions can increase the emotion-laden costly punishment behaviors in organizations.

In addition to expressing emotions, emotion regulation during social interactions has been studied using the Ultimatum Game. Recall the brain region that provides cognitive control in decision making—the dlPFC. To impose cognitive control over emotions, the neurons (i.e., brain cells) in the dlPFC are active to rein in emotions. To ensure that neurons function well, neurotransmitters (i.e., a type of molecules) take on the role of relaying messages from one neuron to another. It is found that neurotransmitter serotonin is involved in decision making in the Ultimatum Game. As noted previously, with our justice motivation, when treated unfairly, we are motivated to punish and retaliate. To refrain ourselves from this aggressive impulse in the face of perceived injustice, serotonin modulates our impulsivity through regulating our emotions. In the Ultimatum Game, when Player 2s' serotonin level is temporarily lowered, they are more likely than the placebo-controlled Player 2s to reject unfair offers, but not fair offers (Crockett, Clark, Tabibnia, Lieberman, & Robbins, 2008). This is because neurotransmitter serotonin is responsible for the function of the brain regions such as the dlPFC and ventral PFC that regulate our emotions (Clarke, 2004).

Inducing emotion also influences decision making in the Ultimatum Game. Player 1s make more generous offers when they are induced the emotion of empathy by watching short video clips of a father sharing his experience with his two-year-old son with terminal brain cancer (Barraza & Zak, 2009). Further, inducing empathy elevates levels of oxytocin—the neurotransmitter associated with social bonding, trust, and generosity (Kosfeld, Heinrichs, Zak, Fischbacher, & Fehr, 2005). A more detailed role of neurotransmitter oxytocin in social decision making is discussed in the section of the Trust Game.

## **Social Identity**

The third construct can be taught by using the Ultimatum Game in training school leaders' decision making is social identity: the socially constructed identity based on ethnic, religious, socioeconomic, and other social categorizations (Roccas & Brewer, 2002). Our social identity influences our decisions in an implicit, unconscious manner. Given the unconscious nature of implicit bias, decision makers may not even be aware of their implicit in-group bias towards those who share their social identity (Haslam, Reicher, & Platow, 2011). Therefore, the Ultimatum Game is a telling way to reveal how decision makers may unknowingly make decisions that are biased towards in-group members, manifested by in-group favoritism and out-group hostility. In one Ultimatum Game study conducted in Israel, Player 2s' names were shared with Player 1s: the first name was a strong signal of Player 2's gender; the last name suggested whether Player 2 immigrated from European or Arab countries, with the latter being from a typically lower socioeconomic background (Fershtman & Gneezy, 2001). To the participants' surprise, male participants made statistically lower offers to the immigrants from Arab countries. In the same

vein, the participants with different cultural backgrounds interacted in the Ultimatum Game differently when they played with the opponents sharing and not sharing their cultural identity. For instance, Westerners (UK participants) and Asians (Malaysian Chinese participants) played differently with participants of their own group than with those of the other group (Chuah, Hoffmann, Jones, & Williams, 2007). The similar findings were also reported among the participants from Hispanic and Navajo cultures in the southwestern United States (Ferraro & Cummings, 2007). Further, it was observed that in the Ultimatum Game, regardless of the ethnic groups, participants accepted more unfair offers from White participants than African Americans (Kubota, Li, Bar-David, Banaji, & Phelps, 2013). These converging findings are particularly important in training school leaders to be culturally responsive, as they gain an understanding of how their own social identity implicitly influences their decisions and ensuing behaviors (Wang, 2019a).

### **Individual Variances**

Individual variances have been observed in people's decision making in social settings. First, people, according to over three decades of research using the Ultimatum Game, demonstrate a varying degree of preference for fairness: some participants do not care about fairness at all; others have a strong preference for fairness (van Damme et al., 2014). This is in agreement with the literature on justice sensitivity: how individuals react to experiences of unfairness and injustice (Yoder & Decety, 2014). People differ in their inclination to perceive injustice and the extent of their cognitive, emotional, and behavioral reactions (Gollwitzer, Rothmund, Pfeiffer, & Ensenbach, 2009).

In addition to explain the rejection decision in the Ultimatum Game through people's preference for fairness (Fehr & Schmidt, 1999), another explanation is that low offers are viewed as challenges, and people who seek dominance in social interactions are unlikely to bow down to challenges, but to reject the low offer in order to demonstrate aggression and cement dominance in interactions. Indeed, this explanation is attested by the evidence that men who reject low offers in the Ultimatum Game have significantly higher testosterone levels than those who accept low offers (Burnham, 2007). This is because among men, there is a consistent, positive correlation between high levels of testosterone and aggression (Book, Starzyk, & Quinsey, 2001), as well as high-testosterone men and seeking social dominance (Dabbs, 1997). Consistent with this view, one study reported that testosterone injections increase the likelihood of rejection decision among male participants in the Ultimatum Game (Kouri, Lukas, Pope, & Oliva, 1995), which suggests that men with naturally high testosterone levels are more likely to reject low offers in the Ultimatum Game. Recall the study that inducing empathy increased oxytocin level and generosity in the Ultimatum Game (Barraza & Zak, 2009). The same study also found that empathy-oxytocin response was stronger in women than in men. This finding can be explained by the opposite effects of oxytocin and testosterone: oxytocin increases social bonding and trust; whereas testosterone is associated with aggression and dominance in the context of competition (Crespi, 2016). Further, testosterone is associated with in-group favoritism as well. In one study, the researchers recruited male soccer fans to play the Ultimatum Game. In the game, the participants were matched by their favorite team (in-group) or their rivalry team (out-group). The participants' testosterone level was associated with a pronounced degree of in-group favoritism: Player 1s' high testosterone levels predicted generous offers to in-group members; Player 2s with higher testosterone levels rejected offers from out-groups more often (Diekhof, Wittmer, & Reimers, 2014).

Taken together, the Ultimatum Game serves as a simple but powerful pedagogical tool for decision-making training in school leadership preparation programs. The rich empirical evidence of the Ultimatum Game research on fairness, emotions, social identity, in-group bias, and individual variances enrich school leaders' understanding as they make social decisions that affect teachers, students, parents, and communities.

### The Trust Game

The Trust Game (Berg, Dickhaut, & McCabe, 1995; see Figure 3) is another game commonly used to study decision making. Similar to the Ultimatum Game, Player 1 is endowed with a sum of money, say \$10. Player 1 can send all, some, or none of \$10 to Player 2. In the Trust Game, however, every dollar sent by Player 1 to Player 2 is tripled by the experimenter. Player 2 receives the tripled amount, and then decides to send all, some, or none of the tripled amount back to Player 1. The amount sent by Player 1 to Player 2 is a measure of trust; the amount returned from Player 2 to Player 1 is a measure of trustworthiness (Ben-Ner & Halldorsson, 2010). Player 1s, on average, send about 50% of the endowment (Berg et al., 1995), but vary by cultural backgrounds and age. Specifically, in a meta-analysis of 162 replications of the Trust Game involving over 23,000 participants, African participants send less money than those in North America (Johnson & Mislin, 2011). Regarding age, in one Trust Game study with 662 participants from 8-year olds to the retired, trust increases linearly from early childhood to early adulthood, and then stays constant throughout adulthood; whereas trustworthiness increases with age (Sutter & Kocher, 2007). The Trust Game can be used in the school leadership preparation programs to teach the decision making-relevant constructs of trust, distrust, and altruistic punishment.

### Trust & Distrust

The Trust Game, as the name implies, can be used to teach the construct of trust in decision making. The research using the Trust Game has provided a nuanced understanding of trust. In one of the seminal studies on trust and decision making, neuroeconomics researchers sprayed

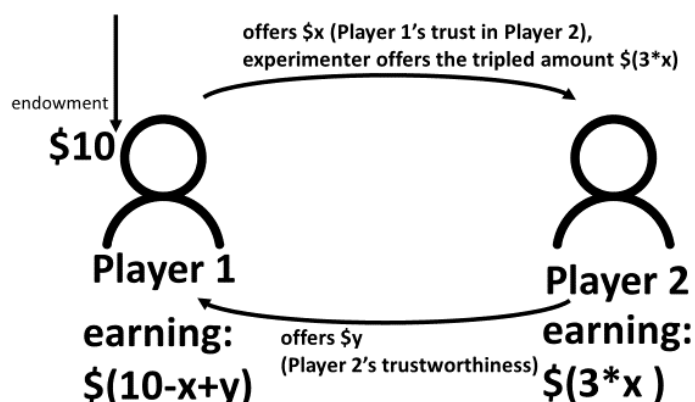


Figure 3. The Trust Game

neurotransmitter oxytocin into the noses of their participants who played as Player 1s and increased their levels of trust and generosity while playing the Trust Game (Kosfeld et al., 2005; Zak, Stanton, & Ahmadi, 2007). This is because when we trust in others, there is intense activity in the

septal area in our brain (Krueger et al., 2007). The septal area is rich in neurotransmitter oxytocin receptors, dampening fear and anxiety when we are in distress and thus motivating us to help others in need (Inagaki & Eisenberger, 2012). However, human trust in their social partners, according to neuroimaging evidence, is often biased towards in-groups, showing in-group favoritism. Intranasal oxytocin administration elevates the level of in-group trust through enhancing the capability of recognizing the facial emotion expressions of our social partners who share our own social identity (van IJzendoorn & Bakermans-Kranenburg, 2012). This finding of the relationship between oxytocin and trust to in-groups is congruent with the literature indicating that oxytocin promotes human ethnocentrism—people believing their own ethnic group or culture is superior to others. In an experiment, people with elevated oxytocin levels through intranasal administration associated more positive words to their own nationality than those in the placebo group in an Implicit Association Test (De Dreu, Greer, van Kleef, Shalvi, & Handgraaf, 2011).

In addition to implicit in-group favoritism, trust is subject to our evaluation of social partners' intentions. The evaluation of our social partners' intentions can be simply primed by semantic framing that subtly indicates friend or foe: participants sent significantly more money when their social partners in the Trust Game was described by the experimenter as “partner” than “opponent” (Burnham, McCabe, & Smith, 2000). The essential role of our evaluation of social partners' intentions in trust is also supported by neuroimaging evidence. Playing the Trust Game, the participants had increased brain activity in the anterior paracingulate cortex, the brain region associated with understanding others' intentions in social interaction, as well as taking the risk of believing that our social partners have benevolent intention and will reciprocate our trust (Krueger et al. 2007; Walter et al., 2004). When the Trust Game is repeatedly played, reciprocity expressed by one player strongly predicts future trust expressed by their partner—a behavioral response associated with the participants' neural responses in the dorsal striatum, a brain region that enables us to derive satisfaction and pleasure by trusting social partners based on the reputation developed by past behavior (King-Casas, Tomlin, Anen, Camerer, Quartz, Montague, 2005). Thus, to create trust in schools, it is important for school leaders to engineer the organizational structure and culture that promote reciprocity in social interactions in schools. Moreover, when participants played the Trust Game with humans and computers, the medial prefrontal cortex in the participants' brain (the brain region enabling us to understand our social partners' mental and emotional states) was more active when their partner was a human (social condition) than a computer (non-social condition; McCabe, Houser, Ryan, Smith, & Trouard, 2001). The differing brain activity patterns in social and non-social decision making lend further support that trust is subject to our evaluation of social partners' intentions.

Distrust, on the other hand, is *not* the opposite of trust (Dimoka, 2014). Instead, distrust is a distinct construct from trust, because distrust and trust activate two different brain mechanisms. Specifically, trust is associated with increased activity in the brain regions supporting social cognition (e.g., the anterior paracingulate cortex and medial prefrontal cortex), including predicting risks, as well as evaluating the social partners' credibility and benevolent intention (Krueger et al. 2007; McCabe et al., 2001; Walter et al., 2004). Trust is also associated with the activation of brain's reward system which is rich in dopamine; therefore, we derive gratification when we trust in others and when they reciprocate our trust (Dimoka, 2014; Krueger et al., 2007). By contrast, distrust is viewed as an emotion-laden construct, associated with the activation in the insular cortex and amygdala—the brain regions enable visceral negative emotions (e.g., anger and disgust) and fear for loss. To that end, distrust is laden with negative emotions, leading to behavioral responses to prevent ourselves from harm; whereas trust arises cognitively, entailing

people's intentional engagement in social interactions (Winston, Strange, O'Doherty, & Dolan, 2002). Put differently, distrust is not the opposite of trust: low distrust does not necessarily mean high trust; low trust does not necessarily mean high distrust.

Further, there is a gender difference in how people respond to distrust. Men respond to distrust with an increased level of dihydrotestosterone—a biologically active metabolite of testosterone associated with aggressive behaviors; in comparison, women reported that they disliked being distrusted, but there was no distinct physiological response or aggressive behavior (Zak, Borja, Matzner, & Kurzban, 2005).


### **Altruistic Punishment**

A variant of the Trust Game can also be used to teach the construct of altruistic punishment in school leadership preparation programs. In one study, Player 1s were informed of Player 2s' action, and Player 1s were also given an option of whether they wanted to punish Player 2s who abused their trust and kept all the money (de Quervain et al., 2004). When our social partners are untrustworthy and abuse our trust, we interpret it as violating the social norm of cooperation and fairness. This norm violation evokes a strong desire in us to punish those defectors, even if the punishment incurs great cost on our end. Punishing violations of social norms activates the dorsal striatum, a brain region that is part of our brain's reward system, and we derive gratification from punishing those who violate the social norms. Such altruistic punishment, like the justice-motivated punishment in the Ultimatum Game, is essential to enforce social norms of cooperation in social interactions by deterring future violations (Boyd, Gintis, Bowles, & Richerson, 2003). School leaders are thus encouraged to identify and reflect on school policies and organizational behaviors that capitalize on altruistic punishment as a means to shaping positive school culture, promoting trust and cooperation, as well as deterring the violation of trust in schools.

You have a \$10 endowment. As a trustor, you can send all, some, or none of the \$10 to the other person (trustee).  
 For every dollar you send, the trustee will receive the tripled amount.  
 The trustee will then send all, some, or none of the tripled amount back to you.  
 Please use the bar to mark how much money you'd like to send to the trustee.

0      1      2      3      4      5      6      7      8      9      10

1



As a trustee, please indicate how much money you'd like to send back to the trustor.  
 The trustor sends you 90% of the endowment, and you receive \$27. How much (\$0-27)  
 would you like to send back to the trustor?

The trustor sends you 80% of the endowment, and you receive \$24. How much (\$0-24)  
 would you like to send back to the trustor?

The trustor sends you 70% of the endowment, and you receive \$21. How much (\$0-21)  
 would you like to send back to the trustor?

...

The trustor sends you 10% of the endowment, and you receive \$3. How much (\$0-3) would  
 you like to send back to the trustor?

*Figure 4.* A screenshot of using the Trust Game in decision-making instruction in a school leadership preparation program. It was set up on the author's university Qualtrics platform. The students fill out the survey in class on their laptops or smartphones via a weblink provided by the instructor. The instructor then uses the students' real-time results to introduce the constructs related to decision making, including trust, trustworthiness, risk taking, distrust, and altruistic punishment. The Public Goods Game

The Public Goods Game (see Figure 5) is used to study social decision making when group interest clashes with self-interest of each group member. It plays in large groups (e.g., four people or more). In a typical Public Goods Game, each group member is endowed with \$10. Group members *simultaneously* decide how to allocate their endowments between two “accounts”: one private and one public. The private account returns \$1 to the group members for each dollar allocated to that account; every dollar invested in the public account triples, and is then split *equally* among the four group members. Thus, group earnings are maximized at \$120 if everybody cooperates and contributes everything to the public account, in which case each of the four group members will earn \$30. However, individual rationality decrees that each group member has the private incentive to contribute nothing, thereby giving rise to the “tragedy of the commons” (Hardin, 1968). Like the in-group bias in the Ultimatum Game and the Trust Game, people also showed their in-group bias in the Public Goods game. Participants’ contribution to the public goods was significantly higher when they shared the social identity with other group members (Parks, Sanna, & Berel, 2001).

Additionally, the Public Goods Game allows school leaders to discover for themselves, and teach one another in the decision-making training about the competing interests between individuals and groups in social decision making. Some students’ decision making is more driven by the incentive to maximize individual interest, while others more readily focus on maximizing the group interest. In addition to teaching decision making when decision makers’ self-interest and group-interest are in tension, this game also demonstrates the importance of reciprocity and punishment to establish and maintain high levels of cooperation and altruism in organizations.

### **Reciprocity Is More Important Than Altruism in Driving Cooperation**

Converging evidence in the Public Goods Game research indicates that reciprocity is more important than altruism in driving cooperation to maximize group interest. In the first round of the Public Goods Game, participants fall into two types by the percentage of endowment they contribute to their public accounts: (1) free-riders who contribute less than 30% of their endowment but reap the benefits from others’ contribution to the public goods, and (2) cooperators who altruistically contribute more than 30% to increase the public goods (Gunnthorsdottir, Houser, & McCabe, 2007). When the Public Goods Game is repeatedly played, participants tend to become reciprocators whose decision to cooperate is contingent on other group members’ contribution to the public goods (Kurzban & Houser, 2005). In another study using the Public Goods Game, when cooperators and free-riders are forced into the same group, the public goods diminish as the cooperators contribute less to the public goods, thanks to the limited reciprocity from the free-riders. However, when cooperators interact less often with the free-riders, the public goods diminish at a much slower rate and, in some cases, cooperators’ public contributions are sustained over repeated rounds in the Public Goods Game (Brekke, Hauge, Lind, & Nyborg, 2011; Gunnthorsdottir et al., 2007). Therefore, to promote and sustain cooperation in organizations, cooperators are recommended to be organized into the groups of similarly reciprocity-oriented individuals. The implication of these findings is to encourage school leaders to reflect on their leadership practices, as well as identify and develop the organizational structure and policies that facilitate reciprocity. If organizational citizenship behaviors—the helping behaviors towards colleagues, supervisors, and students (Podsakoff, MacKenzie, Paine, & Bacharach, 2000)—are considered as the altruism in organizational context, then the finding that positive reciprocity is more important than altruism in driving cooperation suggests that the organizational structure and

policies should be less about commanding people to sacrifice their self-interest in an enduring manner, but more about how to promote positive reciprocity in schools' social interactions.

### Punishment as an Instrument to Foster Cooperation

Punishing free-riders, as the negative reciprocity, promotes cooperation as well. In the Public Goods Game, individual self-interest clashes with group interest. Usually, initial cooperation declines quickly in the Public Goods Game, leading to the “tragedy of the commons” as individuals' self-interest overrides group interest in social decision making (Kagel & Roth, 1995). However, when participants are allowed to punish free-riders (e.g., by investing \$1 to

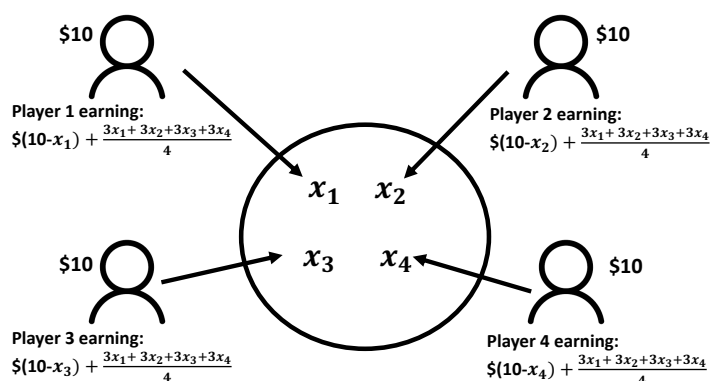


Figure 5. The Public Goods Game

You have a \$10 endowment, and need to decide how to allocate the \$10 endowment between two accounts: one private and one public.  
 In your private account, every dollar you allocate earns \$1 return.  
 In your public account, every dollar you allocate earns tripled amount of return, but will then be split equally among the group members.  
 Your total earnings are the sum of your private and public accounts.

How much (\$0-10) would you allocate to your private account?

How much (\$0-10) would you allocate to your public account?

Total

Figure 6. A screenshot of using the Public Goods Game in decision-making instruction in a school leadership preparation program. It was set up on the author's university Qualtrics platform. The students fill out the survey in class on their laptops or smartphones via a weblink provided by the instructor. The instructor then uses the students' real-time results to calculate the public accounts of all students and announce the earnings for each student's public account.

Next, the instructor asks the students to record their own earnings by using the formula to calculate their earnings. Each student's earning = \$ in private account + \$ earned in group's public account = \$ in private account +  $\frac{3 * \$ \text{ in all students' public accounts}}{\text{number of the students}}$ . This game can be repeatedly played by asking students to allocate the amount of earning from the previous round. Over time, the pattern of altruistic punishment is expected to emerge in the group. The instructor can use the results to



introduce the constructs related to decision making, including in-group bias, reciprocity, altruism, and altruistic punishment. When the instructor reduces non-cooperator's earning by \$3), the free-riders are thus heavily punished and typically increase their contribution to the public goods in future rounds, leading to an increase in cooperation within groups (Fehr & Gächter, 2002). Punishment is also carried out to deter those who *might* violate the social norm of cooperation. Sometimes even the threat of punishment, not necessarily the actual punishment, can be used as deterrence for future norm violations. More importantly, as noted previously, driven by our justice motivation, we derive visceral gratification associated with activation of the dopaminergic reward system, when we punish norm violators, knowing that justice is served (Buckholtz et al., 2008). The more activation of the dopaminergic reward system, the greater cost people are willing to pay to punish (de Quervain et al., 2004). The gratification we gain from the pleasurable dopaminergic surge is particularly important when punishment is costly, as the self-righteous pleasure motivates us to bear the costs of altruistic punishment (Sapolsky, 2017).

Altruistic punishment is costly, especially in the early rounds of the Public Goods Game, when punishment is heavily used to establish the social norm of cooperation. In comparison, reputation formation is a less costly but powerful approach to foster cooperation (Rockenbach & Milinski, 2006). A good reputation is considered as the social rewards in the form of positive social feedback and social approval stemmed from social interactions. To punish free-riders, the group members withhold their social approval and praises, thereby preventing free-riders from forming a positive reputation. Although reputation forming is more cost-effective than altruistic punishment, reputation forming *cannot* substitute costly punishment. In the Public Goods Game, the experimenters sometimes promise rewards for those with a positive reputation of cooperating in the game, such rewards are considered as indirect reciprocity (Nowak & Sigmund, 2005). When given a choice of costly punishment plus indirect reciprocity vs. solely indirect reciprocity in the Public Goods Game, the participants prefer a combination of two. Rockenbach and Milinski (2006) thus concluded that it takes both costly punishment and reputation formation to boost organizational cooperation in social systems.

Another approach to punishment is social exclusion, such as marginalization, ostracism, and excommunication. When ostracism was designed into the Public Goods Game, cooperation increased significantly; more importantly, despite reductions in group size due to ostracism, the net earnings of the group increased (Maier-Rigaud, Martinsson, & Staffiero, 2010). This can be explained by the neuroimaging evidence suggesting that being socially excluded inflicts emotional pain in people by activating the same brain regions (e.g., the anterior cingulate cortex and right ventral prefrontal cortex) that are activated when we feel physical pain (Eisenberger, Lieberman, & Williams, 2003). Therefore, social exclusion derives its deterring force to induce cooperation through inflicting emotional pain in the “bad apples” (non-cooperators) and exclude them from the group.

To sum up, to boost cooperation in organizations such as schools, leaders can develop a three-pronged strategy: (1) reducing in-group bias by crafting a collective social identity, thereby easing the division of Us vs. Them in schools; (2) establishing the organizational norm of cooperation through promoting positive reciprocity; and (3) punishing free-riders who “drink” the water but do not “carry” it for the group. Using a combination of carrots and sticks, school leaders thus ease the tension between individual interest and group interest. Students in the school leadership preparation programs are thus encouraged to reflect on the current school policies and leadership practices that promote and inhibit the development of a collective social identity, reciprocity, and punishment in organizations, and provide recommendations accordingly.

## Conclusion

This article demonstrates how to use three neuroeconomics games adapted from game theory—the Ultimatum Game, the Trust Game, and the Public Goods Game—in training school leaders’ decision making. Most of the decision-making training in school leadership preparation programs and professional development focuses on the value of shared, data-driven, and ethical decision making, rather than how a decision is made exactly (Wang, 2019b). The game-approach decision-making training introduced in this article serve as a proxy for school leaders to identify the blind spots and limitations of data-driven decision making. Participating in the decision-making games and understanding the neural mechanisms of decision making, school leaders could go beyond a behavioral perspective of decision making, reflect on their own decision making process and behaviors in social settings, and translate the constructs related to decision making (e.g., fairness, justice, inequity aversion, reciprocity, emotions, social identity, trust, distrust, and altruistic punishment) to leadership practices. Moreover, these neuroeconomics games could be paired by the cases published in *Journal of Cases in Educational Leadership* for further discussion to meets the PSEL standards (e.g., act ethically and professionally in personal conduct, and act with cultural competence and responsiveness in their interactions).

All three games—the Ultimatum Game, the Trust Game, and the Public Goods Game—advance our understanding of social decision making (van Damme et al., 2014). Building on data-driven decision making, the constructs—along with the compelling empirical evidence—introduced above provide the pedagogical tool for decision-making training in school leadership preparation programs. The Ultimatum Game demonstrates that in addition to self-interest, most people care about fairness and justice. When they are treated unfairly, fueled by anger and disgust, they are willing to punish the offender even at the cost of their own. When given an opportunity to express their negative emotions, they are more tolerant of unfairness. When they regulate their negative emotions, they are less likely to make impulsive decisions. When induced positive emotions such as empathy, they are more generous to their social partners. The Trust Game shows that social cognition-related trust and emotion-laden distrust are two distinct constructs, and carrying out altruistic punishment is one way to engineer trust in organizations. The Public Goods Game indicates positive reciprocity is more important than altruism in driving cooperation, and punishment is essential in establishing the social norm of cooperation. Moreover, all three games show that social decisions are context-dependent and social identity-contingent. School leaders, like all human beings, tend to have an implicit in-group bias; thus, how they make decisions in social settings is subject to whether they and their social partners share the same social identity.

These games are easy to set up to allow students to play in class, attesting to the saying “Everything should be made as simple as possible, but not simpler.” Yet such games are powerful in a way that enriches students’ understanding of social decision making. Instructors in school leadership preparation programs can invite students to play the games in class (see Figure 2, 4, and 6), use the real-time results to introduce the relevant constructs and psychological processes, followed by students’ reflection on their own leadership practices and provide recommendations accordingly in order to engineer better incentives as motivation and punishment as deterrence in organizations.

Finally, the neuroeconomics games introduced in this paper also have significant implications for researchers in educational leadership. Thanks to the social nature of leadership, most empirical studies in the field of educational leadership are either descriptive or quasi-

experimental. It is rare to find leadership studies that are experimental in a controlled environment. In fact, some organizational scholars have already called for pairing neuroeconomics games with neuroscience techniques to explore the underlying causes of the observed behavior in organizations (Volk & Köhler, 2012). Additionally, educational leadership researchers can advance the theory development in the field by building on a growing body of empirical findings in neuroeconomics. One critique in the field of educational leadership is the lack of cohesion in the field's theoretical groundings (Wang, 2018). Neuroeconomics research has already "left a large trove of neural evidence to be mined for insights" (Powell, 2011, p. 1491) in leadership and organizational science. To that end, educational leadership researchers can use empirical findings in neuroeconomics to test theories in educational leadership, and then eliminate inaccurate or ill-fitting theories or advance the theory development in the field.

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